Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
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CARRIER CURRENT SYSTEMS INCLUDING BROADBAND OVER POWER LINE SYSTEMS	)	**ET Docket No. 03-104**
	)	
AMENDMENT OF PART 15 REGARDING NEW REQUIREMENTS AND MEASUREMENT GUIDELINES FOR ACCESS BROADBAND OVER POWER LINE SYSTEMS	)	**ET Docket No. 04-37**

To: The Commission

June 18, 2004

REPLY COMMENTS OF R. DEAN STRAW -- N6BV

R. Dean Straw, a private citizen of the United States of America, respectfully submits these Reply Comments in the above-captioned Proceeding.[1]

I am the holder of an Amateur Extra Class License issued by the Commission and have been licensed as an amateur radio operator by the Commission for more than 40 years. I am a degreed electronics engineer and have been employed as an RF Engineer for more than 35 years. I hold two patents in the area of radio communications technology.

I am replying to Comments filed on behalf of ARRL (the National Association for Amateur Radio) filed May 3, 2004, to Comments of the UPLC, to Comments of the National Telecommunications and Information Administration (NTIA), dated June 4, 2004, and to others.

Introduction

I share the same concerns as ARRL about harmful interference from widespread implementation of Access BPL technology. Like ARRL, I deplore the stonewalling attitudes and

tactics exhibited by several of the electric-supply companies and their technological partners who have participated in limited BPL trials conducted so far in the USA.

I will dwell on this aspect later, with some technical reasons about why efforts to "mitigate" interference have not been wholly successful in several field trials.

Tests Outside USA

Like ARRL, I am dumbstruck by the observation: "Other BPL advocates have, throughout the inquiry portion of the proceeding, simply denied that there is any interference issue at all."[2] The bold assertion from BPL proponents that interference is not a problem betrays, I think, an aura of desperation more than technical incompetence.

"The UPLC was created in recognition that significant trials are underway in various parts of North and South America."[3] This statement is true, on its face, but it conveniently disregards the extensive experience in field trials conducted in the last several years in Europe and the Far East, all of which showed, with little doubt, that interference to licensed HF radio services was "harmful" and even constituted "massive interference."[4]

UPLC goes on to claim, in terms of tests done in the USA: "In all these deployments, there have been virtually no reported instances of interference, and any interference that has occurred has been corrected quickly and easily, using some of the mitigation techniques recommended by

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[1] Notice of Proposed Rulemaking (the "NPRM") in ET Docket No. 04-37 (FCC 04-29, released February 23, 2004).

[2] Comments of ARRL, the National Association for Amateur Radio, May 3, 2004, page 5.

[3] Comments of the United Power Line Council, May 3, 2004, page 2.

[4] "During an emergency exercise of the Austrian Red Cross in May 2003, communication was massively disturbed by PLC, with interference levels exceeding the limits by a factor of 10,000." MEASUREMENT REPORTS, NTIA Phase 1 Study, appendix B.3, Table B-2, April 27, 2004.

the FCC in this very proceeding. In short, Access BPL testing has proven that the interference potential is extremely low, and quite manageable."[5]

This lovely state of affairs painted by UPLC, where interference is not a problem, is addressed by the NTIA statement concerning the official FCC status in which Access BPL systems should be placed: "Certification is appropriate because interference risks posed by Access BPL systems are high relative to other unintentional emitters and the newness of the Access BPL measurement procedures warrants review of measurement reports."[6]

A report of the state of BPL in Germany as of two years ago stated: "Other reports say that the strategy of PLC may have changed. Therefore PLC operators increase their activities in less developed countries, those with a good electricity supply net but relatively few telephone terminals, such as Brazil, India, and even Japan and Russia."[7] [Note: PLC, Power Line Communications, is another acronym for BPL.]

I suppose that squarely puts the United States in the category of a "less-developed country," where we are at least in good company with Japan. Drastic interference during field trials of BPL technology spurred the Japanese government to proceed with great caution concerning widespread BPL deployment in August 2002.

Apologists for these setbacks of BPL in Japan and Europe have pooh-poohed these results, stating in one case: "What was banned in Japan is very old technology."[8] The supplier of this

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[5] Comments of the United Power Line Council, May 3, 2004, page 3.

[6] NTIA Comments, Summary, page ix, June 4, 2004.

[7] "PLC and xDSL Situation in Germany (with a Look Over the Border)", DARC Standards Group, amended June 24, 2002.

[8] Ed Thomas, chief engineer of the FCC, from an interview in *The Christian Science Monitor*, April 26, 2004 edition. Concerning whether the FCC has been able to find any evidence of BPL interfering with nearby radios, Mr Thomas is further quoted: "I'm willing to bet that there won't be a problem, and the [BPL] will be used ubiquitously."

"very old technology" in Japan was none other than one of the same suppliers to several of the failed European trials. And each trial failed in the same fashion -- because of intractable, harmful interference to licensed HF services. The air of desperation for the tiny development companies who have promoted BPL in Europe and Japan (and now in the USA) is becoming palpable. There are few places left in the world where they can fail again because of massive interference problems and the "window of opportunity" to deploy Access BPL before other competing, non-interfering technologies render Access BPL obsolete is closing rapidly. Several prominent BPL trials in the USA have recently been terminated with withdrawal of the participants.[9]

"Cockeyed Optimist"[10]

While I agree in the main with technical conclusions addressed in the NTIA Phase 1 Study of BPL (released April 27, 2004), I am struck by the tone of the follow-up Comments of the National Telecommunications and Information Administration on June 4, 2004.

In a section titled "BPL IS A WIN-WIN PROPOSITION TO THE EXTENT THAT EXISTING AND FUTURE POWER LINE NOISE PROBLEMS ARE REDUCED,"[11] NTIA administrators make the argument: "In fact, existing power line noise and reliability problems that were cast as BPL detriments in the NOI phase of this proceeding likely will be remedied as a result of widespread Access BPL deployment."

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[9] See: http://www.arrl.org/news/stories/2004/06/04/102/?nc=1. The agreement between the city of Manassas, VA, and its original BPL provider has been terminated and Manassas is seeking a new technology partner. The technology used at Manassas was supplied by Main.Net. Further, Pepco has decided to forgo further investment in the BPL business. Current Communications was the technology supplier to PPL in MD. See also "Manassas' innovative Internet service set for change" by Sari Krieger, Smyth County, VA, *Manassas News and Messenger*, June 2, 2004.

[10] A song from "South Pacific" by Rogers and Hammerstein.

[11] NTIA Comments, June 4, 2004, page 4.

Let me see if I can rephrase that glowing assessment: "*Existing power lines are so poorly maintained that they often arc and spark and produce terrible HF line noise. However, if power companies are allowed to deploy BPL, they will have to clear up their own, illegal line noise interference in order for their BPL to work properly*." I'm sorry, but the NTIA comments really sounds like an exquisitely convoluted bit of logic.

Power-line noise is illegal and should be fixed, all on its own demerits. The ARRL Laboratory handles hundreds of power-line noise complaints each year, working with the FCC Enforcement Office to help resolve these problems. And Access BPL itself represents a very significant threat of interference to HF communications.

Unfortunately, the same optimistic (but yet unconvincing) argument appears in the NTIA's unsupported belief, stated: "NTIA believes that BPL operators, as the parties responsible for eliminating harmful interference, will voluntarily implement equipment, organizational elements, and installation and operating practices that prevent interference and facilitate interference mitigation. Market appeal of BPL could quickly evaporate if BPL systems were to endemically cause interference and have to be shut down with operating authorizations swiftly revoked if necessary."[12] Extensive experience by Amateur Radio operators trying to persuade recalcitrant electric companies to eliminate power-line noise indicates that we have good reason to be skeptical about their ability and will to eliminate interference from Access BPL.

Unclear Wording

NTIA states: "NTIA's Phase 1 Study showed that refinements, clarifications and adaptations of Part 15 compliance measurement provisions are needed for Access BPL systems to reduce potential measurement inaccuracies and improve the validity of results for all deployed

[12] NTIA Comments, June 4, 2004, page 8.

BPL systems. Otherwise, *the existing field strength limits provide inadequate certainty that interference risks will be confined to the levels allowed by the field strength limits and other provisions*." [Italics added for unclear wording.] Yes, if the field strength limits for interference are set too high (as ARRL steadfastly maintains the present Part 15 limits are already set for Access BPL wideband systems)[13], then the interference will indeed be severe. Indeed, the German NB30 limits are approximately 30 dB tighter than the FCC Part 15 specifications, and many argue that even NB30 doesn't guarantee interference-free operation of licensed HF operations.[14]

Shifting Frequencies; Reserving Frequencies

Let me introduce a definition. **Zero-Sum Game**: A situation in which a gain by one person or side must be matched by a loss by another person or side."[15] Thus, if you move BPL interference affecting one licensed service to another frequency band, you will now interfere with another licensed service in the new frequency range.

Someone will always lose in this zero-sum game, especially since supporting high data rates in a BPL system requires bandwidth, lots of bandwidth. If that bandwidth is stolen from Peter to pay Paul, Peter is going to suffer. There is no free lunch. The NTIA proposes to set some frequencies aside solely for use by the Federal government. This sounds reasonable and sensible, considering that interference to critical Federal frequencies is in nobody's best interest. But what about everyone else? Shouldn't all licensed services be guaranteed similar interference-free operation?

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[13] ARRL Comments, May 3, 2004, page 5: "*The level of permitted emissions must be far lower in order to protect against interference to licensed, and especially mobile, radio operations in the 1.7-80 MHz bands.*"

[14] BBC R&D White Paper, WHP 067, Sep 2003, "The effects of power-line telecommunications on broadcast reception: brief trial in Crieff."

"Notching"

One of the so-called "mitigation" techniques proposed by proponents of BPL is "notching," where a contiguous band of frequencies is eliminated from the emitted frequency spectrum to avoid causing interference. The theory of notching is elegant, but the devil is in the details. In the field trials in Raleigh, NC, for example, Progress Energy made a well-intentioned attempt to mitigate BPL interference to local Amateur Radio operators, but eventually threw up its hands and said that so far as they were concerned, the interference was not "harmful" at the level they had finally managed to reduce it to. This reduced level, however, was still unsatisfactory to the local amateurs, and several Raleigh amateurs have filed interference reports with the FCC.[16] Reports are starting to filter in about failed attempts at mitigation at other Access BPL test sites.

The problem with "notching" is technical, and unfortunately it is intractable. It deals with the Intermodulation Distortion (IMD) created by any type of transmitter. Access BPL transmitters face a very inhospitable operating environment, including uncharacterized impedances into which they must work and the high peak level of BPL signals. The net result is that transmitter IMD products are created, and these IMD products "refill in the blanks," even when a frequency range of carriers has been supposedly eliminated from the input to that transmitter. Field experience indicates that "notching" on the order of –30 dB is about the maximum possible in practical Access BPL systems; hence the unsatisfactory results reported in Raleigh and in other trials as well worldwide.

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[15] From the American Heritage Dictionary of the English Language, 4th Ed., 2000.

[16] "The BPL Dilemma," Gary Pearce, KN4AQ, *CQ Communications*, 2004.

Measurements Above 30 MHz

So far, all the technical reports that have been filed as Comments or Reply Comments have stopped measurements at 30 MHz. I wish to remind potential vendors and Access BPL suppliers that Part 15.33 (b)(1) for unintentional radiators requires measurements up to 1000 MHz.

Professional and Trade Organizations

From the start of this proceeding, Amateur Radio operators have been like "voices crying in the wilderness" concerning the interference potential of widespread deployment of Access BPL. Despite the fact that many radio amateurs are themselves professionals working in the field of electronics, computers and other engineering disciplines, we were depicted by proponents of BPL as simply being "amateurs," just a bunch of "hams."

Now professional engineering organizations have weighed in. And they agree with Radio Amateurs. The IEEE-USA (The Institute of Electrical and Electronics Engineers) and the Society of Broadcast Engineers, Inc. are two such organizations.

IEEE-USA stated in their Comments: "1. We note that the instant NPRM contemplates new rules and requirements for Access BPL systems that do not currently exist, but for which there is no conclusive evidence of technical feasibility due to potential interference to and from currently licensed users."[17]

IEEE-USA went on to state: "10. Furthermore, the existing radiated emission limits in the Commission's rules for this portion of the spectrum were developed many years ago, taking into consideration a limited number of localized point source radiators, *not in taking into account systems such as Access BPL that are intended to employ what are, in fact, geographically widespread distributed antenna systems that radiate at the prescribed levels virtually everywhere*

[17] COMMENTS OF IEEE-USA, page 2, Introduction.

they exist. Thus, the current limits are, in our opinion, inadequate to afford the necessary level of protection to licensed users of the HF spectrum."[18] [Italics are those of IEEE-USA.]

These are precisely the points that Radio Amateurs have been making in this proceeding all along, and we have filed almost 5,000 comments before the Commission.

The Society of Broadcast Engineers stated unequivocally in their June 1, 2004, Reply Comments, under their subtitle "**1. Proposal <u>Will</u> Cause Interference to Existing Users**": "1. SBE agrees with the comments filed by the American Radio Relay League (ARRL): Although the goal of using broadband signals over power lines to provide expanded Internet access to a wider population is a commendable goal, it cannot justify causing interference to stations now operating on medium wave, HF and VHF low band frequencies."[19]

If any group knows how to make signals radiate on-purpose, it would be the Society of Broadcast Engineers. SBE then firmly stated: "9. SBE again agrees with ARRL that the adoption of the proposed Part 15 BPL rules would get things exactly backwards: Part 15 devices/uses should only be authorized if there is a reasonable expectation that no interference to licensed services would be created in the first place, and not on the assumption that the Part 15 use will cause interference to licensed services, but when the interference occurs the Part 15 user must then implement certain mandatory mitigation measures."[20]

The term "victim receiver" has surfaced in a number of the Comments with respect to licensed users who experience harmful interference.[21] The concept "victim receiver" is certainly

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[18] COMMENTS OF IEEE-USA, pages 3-4.

[19] SBE Reply Comments, dated June 1, 2004, page 1.

[20] SBE Reply Comments, dated June 1, 2004, pages 3 and 4.

[21] For example, NTIA Phase 1 Study, page 31, Table 3-6. And page 53.

alien, even repugnant, to the whole intent and purpose of Part 15, which is to *prevent interference*, not *redress victims*. The whole Access-BPL approach to Part 15 turns Part 15 on its ear.

And the engineers at the NTIA are certainly competent professionals, and the technical analyses and measurements they have taken back up the computations and field measurements done by Radio Amateurs.

The engineers of the California Public Utilities Commission have submitted Reply Comments that urge caution in allowing implementation of Access BPL systems before the technology has been fully tested in all its implications for interference.[22] "For all the foregoing reasons, the CPUC generally supports the FCC's efforts to bring about more competition in the offering of broadband services. However, given that BPL is a nascent service and because there is significant disagreement in the industry over the level of interference, the FCC should ensure that adequate testing is performed and industry standards are developed before any deployment takes place."

Summary

Permit me, please, to try to summarize my Reply Comments by making an analogy:

The Federal government is going to allow a toxic-waste dump to be established in your backyard, but we assure you that toxic emissions will be low.

However, if somehow the emissions from the toxic-waste dump in your backyard do affect you in the future, we are setting up rules so that you can petition the company running the toxic-waste dump to move it to someone else's backyard. And we're confident that all the toxic-waste companies will be excellent corporate public citizens and that they will take care of any problems in a prompt and courteous fashion.

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[22] Reply Comments, the California Public Utilities Commission, June 2, 2004.

And just to be sure that Federal operations vital to your safety and welfare aren't affected by any emissions, we're not going to allow the establishment of any toxic-waste dumps on Federal property.[23]

Unfortunately, this analogy is all too similar to what is being proposed for Access BPL.

FCC Commissioners, I ask you to please consider very long and very hard before creating what will amount to a HF toxic-waste dump, all in an unseemly attempt to shoehorn Access BPL into the present Part 15 rules. It is time to heed the warnings from Europe, from Japan and from the trials conducted in the USA. It is time to withdraw this NPRM and go back to the drawing board on Access BPL. It is a fundamentally flawed approach.

[23] NTIA Comments, June 4, 2004, page 7: "However, additional restrictions are needed in certain frequency bands and geographic areas in order to protect radiocommunications consistent with current rules and practices."